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LAKES RUDOLF AND STEFANIE.

Through Unknown African Countries. The First Expedition from Somaliland to Lake Lamu. By A. Donaldson Smith, M.D., F.R.G.S., Hon. Member of Acad. Nat. Sci., Phil. Pp. xvi + 471, with illustrations and five-sheet map. (London: E. Arnold, 1897.)

THE region of Africa to the south of Eastern Abyssinia has been long regarded as of exceptional interest, both by the naturalist and the novelist. So early as 1847, when most geographers still believed that the snows of Kilima Njaro were a traveller's tale, and before Kenya had been seen by a European, Captain Short returned from the Juba, and asserted the existence of snow clad mountains away to the westward. According to the statements of some native traders to the court of Abyssinia, the bamboo forests of the same region were inhabited by tribes of dwarfs; and these reports were published by Captain Harris in 1844, long before the measurements by Schweinfurth, the skeletons sent home by Emin, and the discoveries of Stanley had called prominent attention to the pigmy races of Equatorial Africa. At a subsequent period, the late M. Abbadie placed a great mountain in the same unvisited district, exaggerating its height, as he recently naïvely remarked, in the hope of calling attention to it. Suahili traders also reported the existence in this region of two great lakes, of which the larger was sometimes called Samburu, and at others was confused with Baringo; it was the hope of reaching this lake region that led to the expedition of Burton and Speke, which came to such a disastrous end at the landing-place near Berbera. The excitability of the Somali, and the fascination of the discoveries made in East Africa south of the equator, subsequently diverted attention from this region, and it was not until 1888 that the first Europeans reached it. Teleki and Höhnel then entered from the south, and found, as reported, that there were two great lakes: the larger was named by its discoverer Lake Rudolf, apparently on the principle of Oliver St. John's dedication of his memoirs to Cromwell, who, by persuading him to travel, had given him the leisure in which to write them. After Teleki's return, several attempts were made to reach the twin lakes from the north, along Burton's projected route. But it was not until 1895 that success was gained by the expedition described in this volume.

The author, Arthur Donaldson Smith, is a young American doctor who prefers sport to surgery. He made a preliminary excursion in Somaliland in 1893, in order to gain experience of the people and the conditions of travel. Having further prepared himself by a course of training in geographical surveying, under Mr. Coles, he returned to Berbera in June 1894. He was accompanied by two English companions—a young sportsman, Mr. F. Gillett, and an experienced taxidermist and collector, Mr. Dodson; both of them gave him most loyal assistance. A force of 82 Somali were enlisted, and 84 camels purchased. The expedition started from Berbera on July 15; Dr. Smith had the advantage of the help of the most famous of African caravan headmen, the late Dualla Idris, who is, however, referred to as Haji Idris. The expedition crossed Somaliland to Milmil, and thence struck westward, and somewhat southward, in the hope of traversing the countries of the Arussa and Janjam to Lake Rudolf. The Webi Shebeli was crossed on September 1, and its course followed to a Galla settlement round the remarkable tomb of Sheik Hussein (the Scech Uscen of Bottego). The native tradition as to the origin of this building is clearly a legend, and more information about it would have been welcome. While staying here, Dr. Smith heard that the Abyssinians were in force at Ginea, a town a little distance to the south Mr. Gillett went to ask the chief for permission to proceed; but after considerable negotiations, during which the Abyssinians were friendly, the permission was refused, and the expedition had to return to the Shebeli. It descended this river to Bari, the village reached by the brothers James and Lort-Phillips in the first crossing of Somaliland. Thence the persevering explorer again turned westward, crossed the Juba, and marched over the Borana Galla country to Lake Stefanie. After exploring this lake, and the district to the north, the expedition continued westward to Lake Rudolf. Dr. Smith followed the course of the river that flows into the northern end of the lake for 75 miles. The river was apparently about to turn to the north-east, but he could follow it no further; and thus it is still uncertain whether the Nianam is the lower part of the Omo. From Lake Rudolf the expedition marched southward, across the waterless wastes of the Rendile country to the Nyiro, and descended the valley of the Tana to the coast.

The narrative of the journey is of great interest throughout. It abounds in sporting adventures, which are tersely and vividly told. The author had narrow escapes from elephants, rhinoceros, and lions. He came into conflict with hostile tribes on one or two occasions; but it was apparently not his fault. African natives are often fools, and it is impossible to read the narrative without feeling that there was nothing the author wanted more than peace. He had diplomatic intercourse with many "kings" and one "emperor," and throughout all his varied experiences he showed himself a man of resource, of courage, and of indomitable perseverance.

The scientific results of the expedition were very important. The five-sheet map, based on an extensive series of astronomical observations, is very valuable. The zoological collections were rich, especially in vertebrates; they are described in a series of appendices by Dr. Günther, Mr. R. I. Pocock, Prof. Jordan, and others, whose names might well have been given in the list of contents as well as the titles of their contributions. The collection of birds was, however, the most important, though there is no report upon it, and there is no complete reference to Dr. Sharpe's paper in which it was described. The general value of the zoological collection lies in the fact that it comes from the unexplored area between southern Somaliland and northern British East Africa. Many of the separate observations are also of interest. The author describes an attack made on a lion by some hyenas; he notes the existence of a large rhinoceros differing from the common species in the shape of the front part of the head. This animal has been recorded twice previously, but it is apparently still represented in Europe by a single horn.

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The principal geological problem, which it was hoped the expedition would settle, was whether the Omo Valley is a continuation of the great East African Rift Valley, in which Lake Rudolf lies. Unfortunately the circumstances which prevented Dr. Smith tracking the Nianam further towards its source are responsible for this question being left open. Dr. Smith, however, believes that the Omo is one of the head streams of the Juba, and does not flow into Lake Rudolf, as is generally believed from Borelli's work. If the altitudes given us are correct, the new view is impossible. Borelli descended the Omo to the level of 3450 feet: Bottego ascended the Juba to a height of over 4500 feet: the Omo cannot flow 1000 feet up hill into the Juba. Another alternative was once possible. We have previously suggested, from Dr. Smith's preliminary map, that "it is just possible that the Omo reaches this lake [Abaya] instead of Basso Narok [*i.e.*, Lake Rudolf]" [Gregory, "Great Rift Valley," p. 258]; but now Dr. Smith fixes the height of Lake Abaya as 3460 feet, so that the Omo is excluded from that goal. Hence, we are driven to the conclusion that the Omo must continue as the Nianam, and flow into Lake Rudolf, as Borelli believed; this conclusion is in agreement with the altitudes and with the trend of the country as shown by Dr. Smith's map.

Another point of interest to geologists is the evidence as to the existence of volcanic activity in this region; for Dr. Smith tells us that the Teleki volcano at the southern end of Lake Rudolf, in August 1895 "sent up clouds of smoke, and at night a great stream of glowing lava could be seen pouring from one of the craters" (p. 333). This information is especially interesting, as Mr. Neumann found no signs of activity there, and as the oft-asserted "Volcano Doenyo Ngai" now turns out not to be a true volcano.

In one respect Dr. Smith's information is strikingly different from that of Teleki and Höhnel. These explorers found the water of Lake Rudolf so brackish that they could hardly drink it, while that of Lake Stefanie was so salt that it was quite useless, and they could only stay on its shore owing to the existence of pools of rain-water. This was in 1888. But in 1895 Dr. Smith found the water of both lakes was quite fresh, in which he is confirmed by a very accurate observer, Mr. A. H. Neumann, for the northern end of Lake Rudolf. There can be no doubt that a remarkable change in the salinity of these lakes has taken place in only seven years; and the possibility of such changes must be borne in mind in considering the origin and relations of the African lake faunas. For example, it has been urged that the marine origin of the Tanganyika fauna is impossible, since there is no trace of marine influence in that of Lake Nyasa, through which the former, on the usual theory, must have passed. But Lake Stefanie reminds us that either a too rapid freshening of a lake, or a period of intense salinity, may obliterate the original fauna. Hence the complete absence of any marine types from the fauna of Nyasa is no proof that that of Tanganyika had not a marine origin. It should, however, be remarked that we are not expressing any acceptance of the view that the fauna of Tanganyika has any marine characters; but only that one of the arguments against that view is invalid.

The part of the book most open to criticism is that dealing with ethnography; but the facts mentioned show that the country traversed is of extreme interest. The author found some dwarf people about five feet high, and gives us a list of their words, although a few phrases would have been more useful; he describes some wells, which he attributes to the ancient Egyptians: and he met with Midgans, Tomal and "half-caste Boran," respecting each of which more detailed information is desirable. One quaint slip in this department is speaking of a "tamasho (*sic*) or equestrian exhibition" as though it were a Somali word instead of Hindustani for a "function." But one man cannot do everything; and now that the author has shown the way, we hope that other travellers will follow and collect further information regarding the many questions which the volume raises. For it is a great testimony to the interest of the country that Dr. Donaldson Smith's valuable book suggests as many problems as it solves.

J. W. G.

EXERCISES IN PHYSICS.

Problems and Questions in Physics. By C. P. Matthews and J. Shearer. Pp. vii + 247. (London: Macmillan and Co., Ltd., 1897.)

THIS useful book contains more than thirteen hundred problems in the various branches of physics, and, from the point of view of degree work, covers the ground required for the London Matriculation and Intermediate Science Examinations, as well as part of that for the Final B.Sc. It is, however, intended for all students of elementary physics, including, therefore, students of engineering, and the peculiar needs of the latter have also been provided for.

The authors begin with an introduction, which, as they explain, is intended not only to be read, but continually referred to, and contains short sections on physical measurement in general, units, vectors, the expression of physical relations by curves, averages, and approximations. A few examples are added on graphic methods, as well as a list of units and physical constants for use in the problems. Next follow the problems themselves; and the book ends with a set of four-figure mathematical tables, the solutions to the problems, and a rather meagre index.

In a work designed for students of both engineering and physics, one naturally looks first to see what is said on the vexed question of the unit of force. We congratulate the authors on the line they have here taken. As they explain in their preface,

> "Many of the students who will use these problems are pursuing engineering courses. In such case, they must of necessity use engineering units. The aim has been not so much to train them in the use of these units—an abundance of this training comes to them during their course—but to bring out the relation of the so-called practical and gravitational units to the C.G.S. units of physics."

The C.G.S. and foot-pound-second systems are first defined, and the superfluous character of the latter tacitly assumed. This is shown by the fact that, after its definition has been given, the word poundal does not again occur. The authors then explain that pound and kilogramme are used by engineers as names for units of

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